Name:_____

NASA Tropical Rainfall Measuring Mission (TRMM)

TOPIC #1: TRMM: Why Measure Rainfall from Space?

Activity #4: Interpreting TRMM's Satellite Images
National Science Content Standards A,B,C,D,E,F & G

OBJECTIVE: To interpret rainfall data collected remotely by NASA's Tropical Rainfall Measuring Mission (TRMM) satellite.

BACKGROUND: The satellite images used in this Internet activity represent a collection of rainfall data for the month of January 1998. NASA's Tropical Rainfall Monitoring Mission satellite called TRMM collected this data using "remote sensing". This means that the information was collected or **sensed** by instruments from a **remote** distance of 215 miles (350 km) above the Earth. The satellite senses wavelengths of the Sun's energy that reflect off rain or water droplets in clouds. The instrument also senses latent heat that is released when the water vapor condenses into clouds or rain. The "composite" or collection of images is displayed on a world map to represent the information gathered from the tropical regions of Earth. The map is not the actual image seen by the satellite. Data representing rainfall readings are assigned a color called "false color" to indicate the varying amounts of precipitation. A key is used to interpret the amount of rainfall on the map. Black areas indicate "no data" or no information. This area is out of range of the satellite. Monitoring data related to rainfall and the heat that is released during condensation will allow scientists to build more accurate climate computer models. These models may help predict changes in weather patterns due to Global Warming. Increased levels of carbon dioxide gases resulting from the burning of coal and gasoline may be causing a warming of the Earth's atmosphere.

MATERIALS:
Computer with Internet access

TECHNOLOGY RESOURCES:
Web address: <**http://trmm.gsfc.nasa.gov**>

VOCABULARY:
Composite Image – a collection of satellite data represented on one image.
False Color – the colors assigned to the range of satellite data when it is presented on images such as a map.
Global Warming – a gradual increase in the temperature of the Earth's atmosphere due to the addition of carbon dioxide gases from the burning of fuels such as coal.
Latent Heat – heat that is "stored" as the increased motion of water molecules as they evaporate and become water vapor. This heat is released when water vapor condenses back to a liquid.
Remote Sensing – the process by which instruments on an orbiting satellite detect wavelengths of energy reflected from Earth.
TRMM – a NASA satellite that monitors rainfall and latent heat in the tropical regions of Earth.

PROCEDURE:

1. Enter the address< http://trmm.gsfc.nasa.gov/data/eoshearing_md.html >
(Note: You need to use an underline in the above address in the following position: "eoshearing_md.html")
2. Go to image at the middle of screen entitled "Average Daily Rainfall (January 1998)"

INTERPRETATION

Note the section entitled "Average Daily Rainfall (January 1998)"
Use the upper image entitled " TRMM Microwave Imager (mm/day) to answer the following questions:

1. What color represents 8mm/day (8 millimeters of rain daily)? _____

2. Rainfall is indicated for what month and year? _____

3. What ocean shows the greatest amount of rainfall? _____

4. What is the daily rainfall for the Sahara Desert in northern Africa? _____

5. If heat is released when clouds and rain form, where is the greatest amount of heat being released into the atmosphere? _____

6. In general is there more rain above or below the Equator which is the horizontal dotted line at the middle of the map? _____

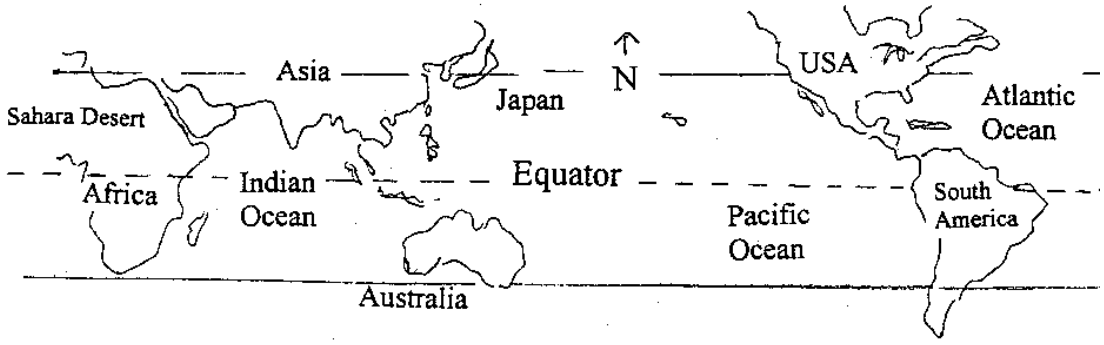
7. If it is January, what season is occurring in the United States? _____

8. If the northern and southern hemispheres have opposite seasons, what season is it in Australia? _____ How much rain is eastern Australia experiencing? _____

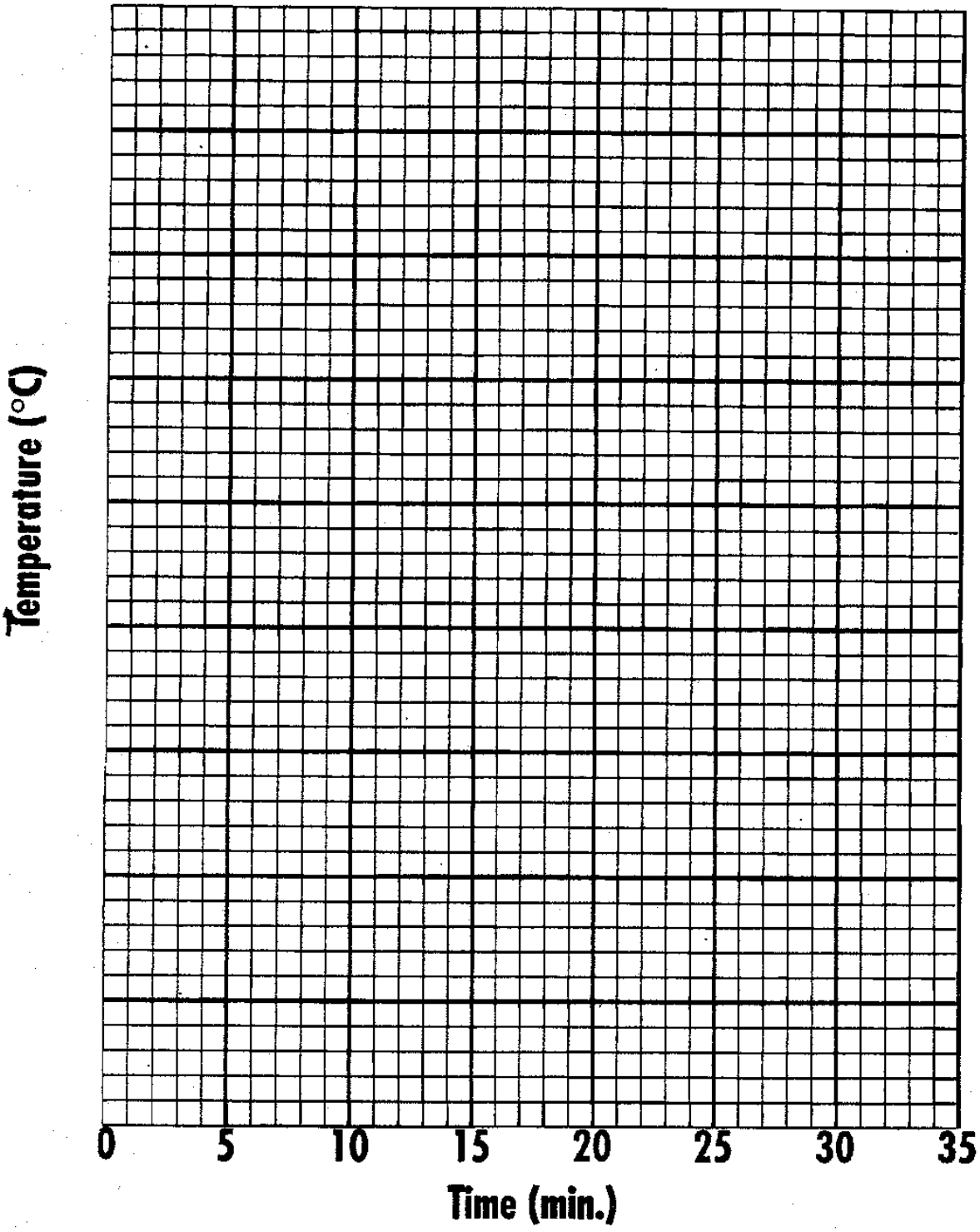
Use the lower image entitled " Coincident Infrared" to answer this question:

9. This image indicates locations where heat (infrared) energy is released. Over what continent is the atmosphere indicating the greatest infrared heat?
_____

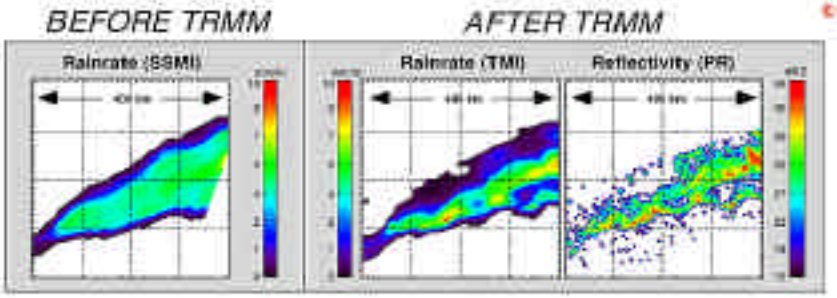
10. On the map below, shade the areas of the greatest amount of rainfall as shown in red on the map entitled" TRMM Microwave Imager".



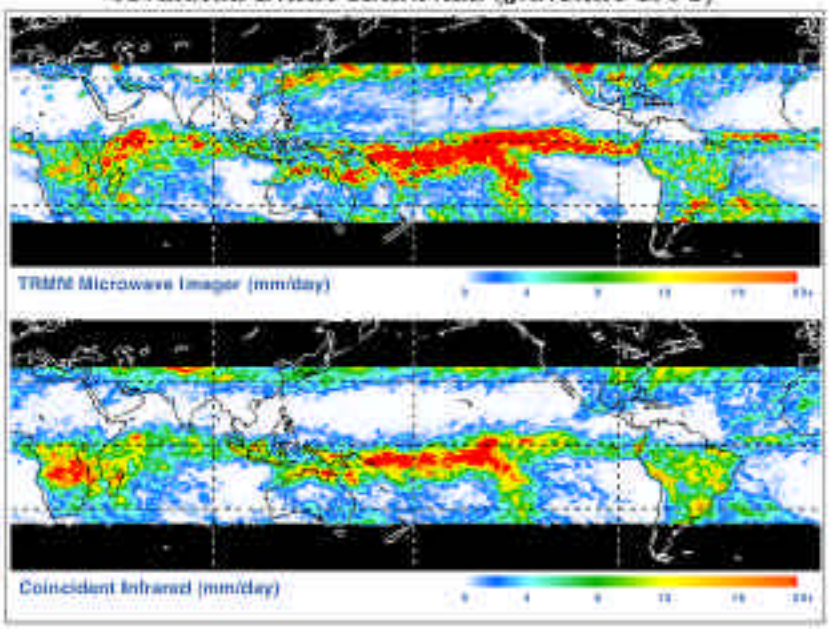
NASA/TRMM TOPIC #1
Activity #3: Latent Heat's Disappearing Act
Graph



Tropical Rainfall Measuring Mission (TRMM)



Average Daily Rainfall (January 1998)



Total Number of Lightning Flashes (January 1998)